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Elderly from lower socioeconomic groups are more vulnerable to mental health problems, but area deprivation does not contribute: a comparison between Slovak and Dutch cities

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Background: Little is known about factors associated with mental health problems (MHP) of the elderly in socioeconomically deprived neighbourhoods, and comparisons between Central European and Western European countries on this topic are lacking. We examined whether MHP occurred more frequently in deprived neighbourhoods and among deprived people. Next, we examined whether the association of MHP with area deprivation differed by country and whether this could be explained by the socioeconomic (SE) characteristics of the residents. **Methods:** We obtained data on non-institutionalized residents aged 65 years and above from the EU-FP7: EURO-URHIS 2 project from Slovak ($N = 665$, response rate 44.0%) and Dutch cities ($N = 795$, response rate 50.2%). An elevated score on General Health Questionnaire-12 (≥ 2) indicated MHP. Education and household income with financial strain were used as measures of individual SE status. We employed multilevel logistic regression. **Results:** Overall rates of MHP were significantly higher in Slovakia (40.6%) than in the Netherlands (30.6%). The neighbourhood unemployment rate was not associated with the mental health of elderly in either country. Rates of MHP were significantly higher among elderly with low and medium income [odds ratio (OR) = 1.75, 95% confidence interval (CI) = 1.16–2.62; OR = 1.64, 95% CI = 1.12–2.41, respectively] and financial strain (OR = 2.26, 95% CI = 1.56–3.28) when compared with those with high income and no strain, respectively. Individual-level SE characteristics explained differences between the two countries. **Conclusion:** The risk of MHP among the elderly is associated with their individual-level SE position but not with neighbourhood deprivation in both Slovakia and the Netherlands.

Introduction

Both urbanization and population ageing have become phenomena, which concern public health professionals and policy makers worldwide.[1,2] As people age and their mobility declines, the neighbourhood socioeconomic (SE) environment may become more relevant for their mental well-being. A growing body of evidence shows urban predispositions for mental health problems (MHP).[3] Chronic stress, long-term exposure to stressful life events, lack of social support, lack of financial resources and high costs of living may predispose elderly living in cities to MHP.[4] Older people are vulnerable for biological reasons but also because of their social circumstances, as significant numbers of the elderly have a low income.[5]

Extensive evidence shows an association between area SE characteristics and mental health disorders,[6] but regarding the elderly evidence is scarce, as shown in a review by Yen *et al.*[7] At the same time, Yen *et al.* reported that neighbourhood-level SE position was the strongest and most consistent predictor of a variety of health outcomes. Regardless, the available evidence on area differences in the mental health of urban elderly is limited. It mainly concerns specific mental disorders, such as depression or anxiety[8] and not overall MHP.

Even though European cities share common features, such as population density or environment, the health of citizens may vary. International comparisons of factors associated with the mental health of the elderly in socioeconomically deprived neighbourhoods are fully lacking. Such comparisons are important, particularly in the context of existing knowledge on the life course. First, those who spent their adolescent and adult years in environments of relative economic deprivation are for the most part economically worse off also in their old age.[9] Second, the individual SE position across the life course has an impact on health in late life.[7] Third, older adults are especially vulnerable to changing economic circumstances.[5]

A comparison of countries with different economic and political situations may provide information on the effects of these factors. Slovakia, as a Central European and 'new' EU member country (joined in 2004), and the Netherlands as a Western European and 'old' EU member country offer a good possibility to explore this issue. In our previous study, which concerned the population in productive age group (19–64 years), we found a gradient relationship regarding the rate of MHP and area unemployment in the Netherlands but not in Slovakia.[10]

We examined whether MHP occurred more frequently in deprived neighbourhoods and among deprived people. Next, we examined whether the association of MHP with area deprivation differed by country and whether this could be explained by the SE characteristics of the residents.

Methods

Sample and procedure

Data were collected within the European Urban Health Indicators project (EURO-URHIS 2) in the two largest cities in Slovakia—Bratislava (capital; 432,801 inhabitants in 2010) and Kosice (233,886 inhabitants in 2010)—and in two comparable Dutch cities—Amsterdam (capital; 779,808 inhabitants in 2010) and Utrecht (311,367 inhabitants in 2010). In each city, a representative sample of 800 persons aged 65 years and above, stratified by gender, was approached. In both countries, the sampling frame excluded institutionalized persons.

All respondents received identical self-administered postal questionnaires in their own language along with a stamped return envelope. Power calculation was done by the EURO-URHIS 2 team. To detect an estimated prevalence of 30% with an acceptable error of ±5% and a confidence of 95%, the target population in each country required 400 responders for age group 65 years and above, equally distributed by sex.

Regarding the Slovak cities, the sample was randomly selected by the Population Registry Office of the Slovak Republic. To motivate respondents, a raffle (9 gift vouchers of €10) and gift incentives (a bookmark with calendars) were used. Non-respondents were contacted repeatedly by two postal reminders and by telephone. Data collection lasted from September 2010 to March 2011.

In the Dutch cities, the sample was randomly selected from the municipal population register in each city. As an incentive to participants, a raffle (4 gift vouchers of €50) was used in Amsterdam, and a lottery (2 vouchers of €100) was used in Utrecht. Non-respondents in Amsterdam were contacted in two additional mailings, and in Utrecht they were also approached by phone calls. Data collection lasted from September 2010 to January 2011.

Invalid addresses ($n = 58$), deaths ($n = 4$) and incapacities to complete the questionnaire with living/working abroad ($n = 26$) were deducted from the original Slovak sample size. Thus, the overall response rate in Slovakia was 44.0% ($n = 665$); refusals comprised 33.1% ($n = 500$) and other non-responses 22.9% ($n = 347$). Respondents did not differ from non-respondents regarding gender (Cohen's W 0.03).

The overall response rate in the Netherlands was 50.2% ($n = 795$), after invalid addresses ($n = 4$), deaths ($n = 5$) and incapacities to complete the questionnaire ($n = 6$) were subtracted. Refusals represented 24.0% ($n = 380$) and non-respondents 25.9% ($n = 410$). Respondents did not differ from non-respondents regarding gender (Cohen's W: 0.001).

Measures

The original questionnaire of EURO-URHIS 2 was translated from English into both Slovak and Dutch and back translated afterwards. Differences between original and the back translation were discussed by the research team to optimize the translation.

Individual-level data

MHP were measured by the General Health Questionnaire (GHQ-12).[11] The GHQ-12 is used as a screening tool to detect mental disorders in the general population. The questions regard the past 2 weeks (e.g. felt capable of making decisions, feeling unhappy and depressed) and the respondent has to rate how usual this was on a 4-point scale (more so than usual/much less than usual). If the number of missing items was ≤2, the average GHQ score was inserted for the missing items. We scored responses bi-modally (0-0-1-1) with reversing of responses where needed. The higher the score, the more problems a respondents has met. Having MHP was defined as a GHQ-total score ≥2.

'SE status' of respondents was measured by educational level, household income and financial strain. 'Education' (The European Health Interview Survey—EHIS, 2006) was assessed by a question on the highest educational level attained. Responses were divided into three categories: no formal education and primary education were categorized as low educational level, whereas the other two groups represented respondents with a secondary and a university education, respectively.

'Composition of the household' concerned the number of adults aged 18 years and over and children aged 0 to 17 years who lived in the household.

'Household income' was measured by self-reported annual household income (EHIS, 2006). Income per capita was adjusted for household size per the OECD modified scale by dividing the number of adults and children in the household.[12] These were then divided into tertiles, with a low, medium and high income category.

'Financial strain' (EURO-URHIS 2, 2011) was assessed by asking respondents 'Do you have enough money for daily expenses, e.g. accommodation, travel, clothing, food?' with answer options of yes or no.

A semi-open question on 'ethnic background' resulted in 23 options. Therefore, in the statistical analyses, we dichotomized this item as indigenous and non-indigenous residents. Indigenous residents comprised a white European type of background. Non-indigenous residents comprised all other types of background.

'Presence of a long-standing illness' (EHIS, 2006) was measured by a self-reported question: 'Do you suffer from any long-standing illness, long-standing effect from injury, disability or other long-standing condition?' with possible responses of Yes (1), No (2) and Don't know (3). Option 3 was tracked as a missing value.

'Living with or without a partner' (EHIS, 2006 modified by EURO-URHIS 2) was assessed from a question on civil status, which offered the response: married (1), cohabiting (2), living together (3), single (4), separated (5), divorced (6), widowed (7) and no partner (8). Options 1–3 were coded as living with a partner and options 4–8 as living without a partner.

Neighbourhood-level data

Neighbourhood unemployment rate was chosen as a measure of area deprivation, as it might be a source of urban stress and have an impact on the mental health of residents in a neighbourhood. Slovak neighbourhoods involved local administrative units on the lower level (the LAU 2 level) as defined by Eurostat.[13] Dutch neighbourhoods were areas based on postcode sectors. We used census data for Slovak[14] neighbourhoods and registered unemployment municipality data for Dutch neighbourhoods[15] to obtain the total proportion of unemployed people (unemployed ≥ 16 years looking for their first job or having worked before). Data were split into tertiles of deprivation (least favourable, medium and most favourable) and were separately constructed for Slovakia and for the Netherlands. Respondents with missing values for MHP ($n = 15$) and area deprivation ($n = 1$) were excluded from the analysis.

Statistical analyses

First, we assessed differences in MHP in each country by tertiles of area deprivation using chi-squared tests. Second, we employed multilevel analyses to assess differences in MHP by area deprivation. We computed the odds ratios (ORs) for tertiles of deprived neighbourhoods, crude and adjusted for possible confounders. These concerned age, sex (and their interactions), ethnicity, long-standing-illness as they are all known to affect levels of MHP. However, to prevent over adjustment and collinearity with the main outcome variable, we did not adjust for other confounders such as social capital.

We then added the country into the model and the interaction of the country with area deprivation. Third, we added the measures of

Table 1 Background characteristics of the samples per country, age range 65 years and above[a]

Variables	Total sample ($N = 1388$), mean age (±SD): 73.7 (±6.6)				
	Slovakia ($N = 638$)		Netherlands ($N = 750$)		P^b
Age					
Mean age (±SD)	72.8 (±) 6.1		74.5 (±)7.0		<0.001
	N	%	*N*	%	
Sex					NS
Men	350	54.9	379	50.5	
MHP					<0.001
Yes	259	40.6	237	31.6	
Adjusted household income[c] (€)					<0.001
Mean (±SD)	6504.2 (3312.6)		24 711.7 (19 341.5)		
Household income					
Low	188	33.8	173	34.1	
Medium	184	33.0	167	32.9	
High	185	33.2	167	32.9	
Educational level					<0.001
Low	92	14.4	181	25.0	
Secondary	319	50.1	379	52.3	
University	226	35.5	164	22.7	
Financial strain					<0.001
Yes	186	29.6	63	8.6	
Ethnic background					<0.001
Non-indigenous	5	0.8	53	7.2	
Long-standing illness					<0.001
Yes	446	74.8	400	57.7	
Living with a partner					
Yes	412	64.8	424	56.5	<0.01

a: Percentages do not always add up to 100% due to rounding.
b: Chi-squared test for categorical and *t*-test for continuous variables.
c: Categories of adjusted household income (in Euros): for Slovakia low <5120.00, medium 5120.01–6720, high >6720.01; for the Netherlands low <16 000, medium 16 000–25 000, high >25 000.01.

individual SES to the model (education, household income, financial strain) separately and jointly and assessed whether these explained area differences in MHP. We then computed median OR (MOR) as interpretable measures of neighbourhood-level variance.[16]

The occurrence of MHP was modelled as a binary outcome variable in logistic regression models of citizens (level 1) nested within neighbourhoods (level 2). Multilevel regression analyses were performed in MlwiN 2.02.[17] All other analyses were done using IBM SPSS 20 for Windows (IBM, Chicago, IL).

Results

Characteristics of the sample

The Slovak sample comprised 638 respondents from 30 neighbourhoods. The mean age of the residents was 72.8 years [standard deviation (SD) = 6.1]; 54.9% were men. The Dutch sample comprised 750 respondents living in 102 neighbourhoods. The mean age of the residents was 74.5 years (SD = 7.0); 50.5% were men. Respondents' background characteristics outcomes per country are described in Table 1. All characteristics varied significantly between the two datasets, except for sex and household income.

The overall rates of MHP significantly differed between Slovakia (40.6%) and the Netherlands (31.6%). There were also between-country differences in the prevalence of MHP per tertiles of area deprivation. In Slovakia, we observed a flat pattern: 42.6% of the respondents in the most favourable neighbourhoods had MHP, compared with 36.6% and 42.1% in the medium and the least favourable neighbourhoods, respectively. On the other hand, in the Netherlands, a gradient was present. MHP occurred more frequently among respondents from the least favourable neighbourhoods (35.7%) compared with the most favourable neighbourhoods (27.8%) (Table 2). However, differences between the level of area deprivation and occurrence of MHP were not statistically significant in either the Netherlands or in Slovakia.

Table 2 Prevalence of an elevated score on the GHQ-12 in tertiles of area deprivation regarding unemployment rate in urban neighbourhoods in Slovakia (Bratislava, Kosice) and in the Netherlands (Amsterdam, Utrecht) among residents aged 65 years and above

	Elevated score on GHQ-12, *n* (%)			
	Slovakia	*P*	The Netherlands	*P*
Area deprivation				
Most favourable	100/235 (42.6)	0.395	77/277 (27.8)	0.147
Medium favourable	71/194 (36.6)		71/224 (31.7)	
Least favourable	88/209 (42.1)		89/249 (35.7)	
Overall	259/638 (40.6)		237/750 (31.6)	<0.001*

Significance levels χ^2 statistics
*For between-country differences in prevalence of MHP.

Multilevel logistic regression showed that the relationship between MHP and area deprivation was not statistically significant in the crude model (not shown) or in the model adjusted for potential confounders (Table 3) (Model 1). This relationship was the same for both countries, as was shown by the non-significant interaction of area deprivation by country (Model 2). However, the risk of MHP was higher in Slovakia than in the Netherlands. Slovak citizens had

Table 3 OR with 95% CIs of MHP in tertiles of area deprivation regarding unemployment rate in urban neighbourhoods in Slovakia (Bratislava, Kosice) and in the Netherlands (Amsterdam, Utrecht) among residents aged 65 years and above

Adjustments	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Area deprivation						
Most favourable	1	1	1	1	1	1
Medium	1.06 (0.79–1.43)	1.26 (0.82–1.92)	1.02 (0.59–1.75)	1.15 (0.74–1.76)	1.17 (0.76–1.79)	0.92 (0.53–1.60)
Least favourable	1.18 (0.89–1.58)	1.25 (0.83–1.89)	1.41 (0.85–2.33)	1.13 (0.75–1.72)	1.18 (0.78–1.80)	1.34 (0.80–2.24)
Country						
The Netherlands		1	1	1	1	1
Slovakia		**1.73** (1.15–2.60)	**1.89** (1.18–3.02)	**1.83** (1.22–2.77)	1.39 (0.91–2.11)	1.57 (0.96–2.57)
Interaction area deprivation × country						
Slovakia*most favourable		1	1	1	1	1
Slovakia*medium favourable		0.71 (0.39–1.29)	0.80 (0.39–1.61)	0.72 (0.39–1.31)	0.76 (0.41–1.40)	0.88 (0.43–1.82)
Slovakia*least favourable		0.89 (0.50–1.60)	0.69 (0.35–1.35)	0.93 (0.52–1.68)	0.96 (0.53–1.75)	0.74 (0.37–1.48)
Ethnicity						
Non-indigenous	1.23 (0.69–2.21)	1.49 (0.82–2.72)	1.20 (0.57–2.55)	1.41 (0.75–2.66)	1.22 (0.65–2.28)	1.11 (0.50–2.49)
Long-standing illness						
Yes (vs. no)	**3.41** (2.58–4.51)	**3.16** (2.38–4.20)	**2.57** (1.86–3.54)	1.13 (0.85–1.50)	**3.04** (2.27–4.07)	**2.44** (1.76–3.40)
Measures of individual SES						
Low income status (vs. high)			**2.24** (1.56–3.23)			**1.75** (1.16–2.62)
Medium income status (vs. high)			**1.97** (1.37–2.82)			**1.64** (1.12–2.41)
Low education (vs. university)				**1.80** (1.22–2.65)		1.13 (0.69–1.84)
Secondary education (vs. university)				**1.55** (1.15–2.09)		1.33 (0.94–1.88)
Financial strain (vs. no strain)					**2.50** (1.81–3.45)	**2.26** (1.56–3.28)
Random (MOR)	1.00	1.00	1.00	1.00	1.00	1.00

Statistical significance at $P < 0.05$ is indicated in bold. Model 1: adjusted for age, sex and their interactions, ethnicity, long-standing illness. Model 2: idem Model 1 + country, interaction of country by area deprivation. Model 3: idem Model 2 + income status. Model 4: idem Model 2 + educational level. Model 5: idem Model 2 + financial strain. Model 6: idem Model 2 + income status, educational level, financial strain.

almost twice the risk of MHP than Dutch citizens (Model 2) [OR: 1.73, 95% confidence interval (CI): 1.15–2.60].

Separate adjustments for measures of individual SE indicators did not change the relationship between area deprivation and MHP. In models adjusted for income (Model 3) and education (Model 4), the risk of MHP was again significantly greater for Slovak elderly than for the Dutch. The biggest difference in the gradient between countries was found after inclusion of financial strain (Model 5). Differences between countries diminished after adjustment for individual SE measures.

Overall, the increased risk of MHP was significantly higher among elderly with low and medium income (OR: 1.75, 95% CI: 1.16–2.62; OR: 1.64, 95% CI: 1.12–2.41, respectively) and financial strain (OR: 2.26, 95% CI: 1.56–3.28), compared with those having a high income and no strain, respectively.

Area clustering of MHP was not observed in any model.

Discussion

We made four major observations in this study. First, neighbourhood-unemployment rate was not associated with the mental health of the elderly in either country. Second, overall rates of MHP were significantly higher among the elderly in Slovakia than in the Netherlands. Third, individual-level household income and financial strain were associated with mental health. Fourth, individual-level SE characteristics explained part of the differences between the two countries.

We did not find any associations between neighbourhood-unemployment rate and mental health, either in Slovakia or in the Netherlands. Several other studies did also not find any evidence between neighbourhood SE position and mental health among elderly.[18] An explanation might be that area-level factors other than deprivation per se are more important for the elderly in a city context. These might be, e.g. features of the built environment, such as safe walking paths or green areas,[19,20] which promote participating in leisure/community activities and further social participation accompanied by social support.[21] However, such features are likely to be less favourable in deprived areas too, making this explanation less likely. Another explanation may be that subjective measures of neighbourhood environment better measure relevant aspects of area deprivation, as they are based on the individual's perceptions. Indeed, a review by Yen *et al.*[7] shows stronger associations for such studies than for those which used objective measures. Third, early life exposure to area deprivation may overrule the effect of current exposure. Very recent findings of Wight *et al.*[22] show that exposure to the neighbourhood unemployment rate earlier in life may be important for mental health later in life.

We found a difference in the overall prevalence of MHP between Slovakia and the Netherlands. In Slovakia, almost every second elderly was affected by a mental disorder compared with every third in the Netherlands. A comparison of 10 Western and Southern European countries[23] suggests that residents exposed to higher levels of country-level inequality suffer from more morbidity than residents from countries with less inequality. In contrast to our expectations, however, the Gini coefficient—a measure for inequality—was similar in both countries (25.9 in Slovakia and 25.5 in the Netherlands in 2010).[24] However, countries differed in the proportion of population at risk of poverty (i.e. having less than 60% of median equivalized income after social transfers)[25] and in historical unemployment rates. In Slovakia in 2010, 7.7% of residents older than 65 years were at risk of poverty compared with 5.9% of residents in the Netherlands.[26] The unemployment rate in Slovakia ranged from 12.9% in 1998, with a peak of 19.5% in 2001 and 14.5% in 2010. In contrast, the unemployment rates in the Netherlands were rather stable and low, being on average 3.9% (1998–2010).[27] Based on the conclusions of Wight *et al.*[22], this gives us some hints on the explanation of the worse mental health in elderly in Slovakia than in the Netherlands.

Additionally, rates of MHP were higher among Slovak elderly than among Dutch elderly. This higher rate in Slovakia may be linked partially to the higher prevalence of long-standing illnesses in the Slovak sample (above 70%). Regardless, rates in both countries are high, even more so if the fact that this concerns independent (i.e. not-institutionalized) living elderly is taken into consideration. In line with this, the European Health and Life Expectancy Information System (www.eurohex.eu) project estimated that at the age of 65 years, Slovak citizens could expect

the fewest healthy life years within EU countries.[28] This raises several questions on the quality of life of aging people, as elderly with better physical health are more psychologically resilient, live longer and have healthier lives.[4] Regarding this, analyses without adjustment for long-standing illnesses yielded an even more elevated risk for Slovak elderly across all models (results not shown).

The higher risk of MHP among Slovak elderly compared with Dutch elderly was further explained by financial strain and by the other indicators of individual SES, suggesting that a generally more adverse individual SE position may add to the country differences. Individual-level SE characteristics were associated with MHP in both countries. Elderly with a low-income status and in financial strain had twice the risk of MHP than the better off elderly. Low income together with financial strain may act as stressors and influence mental health. However, because of the cross-sectional design of our data, we cannot establish a direction for this relationship. Nevertheless, these results show that elderly from lower SE groups are more vulnerable to MHP. It may also suggest that SE inequalities in health persist to older ages, which may offer routes to influence this, e.g. by policies aiming at the reduction of financial strain among the elderly.

Study strengths and limitations

Strengths of our study are that we used a standardized sampling, recruitment and data collection protocols developed within the EURO-URHIS 2 project. To our knowledge, this is the first study that provides a comparison of MHP in urban-dwelling elderly from Central and Western European cities. The data were collected in both countries at the same time of the year, making seasonal influences on the MHP unlikely to cause inter-country differences. Next, we used a validated instrument to detect MHP. Further, we respected the hierarchical nature of the data and applied multilevel analyses. Finally, the use of neighbourhood unemployment rates as the indicator of area deprivation and social context facilitates the translation by policy makers of our findings to interventions. However, the use of only neighbourhood unemployment rates as the indicator of area deprivation may also be considered as a limitation. It should be confirmed using other indicators as well, although it has been used as a valid indicator also in other studies.[29–32] It reflects individual-level, income-related deprivation and connects to a lack of appropriate skills and competencies in a given community.[32] Another limitation is the relatively low response rate, although no differences between respondents and non-respondents were detected (Cohen's W in both countries was <0.01), and response rates were rather similar in both countries. We were only able to assess differences between respondents and non-respondents in this fixed age group by gender. Further, better educated elderly are over-represented in the survey. A final limitation is the cross-sectional design, which does not allow us to unravel the causal relationships between area deprivation and the mental health of residents.

Study implications

We found that in both countries, the risk of MHP in the elderly is associated with their individual-level SE position rather than with the SE position of their living area. Nowadays, in a period of economic recession, growing urbanization and increasing longevity, it is important to target the mental health of the elderly, who are often more dependent and vulnerable than groups in productive age. In the elderly, it is expected that the burden of economic cuts could lead to more MHP. Thus, policy makers in both countries should focus on the mental health of the frail elderly as much as possible. They should note that certain policies and decisions may result in financial strain which showed to have a relatively strong association with MHP. Moreover, in Slovakia, and maybe in other Central European countries, policies are needed to prevent the population in the productive age group from long-standing illnesses in later life.

Future studies with a longitudinal design might help to disentangle the relationship between area-level (SE) characteristics and (mental) health in older adults, as long-standing illness and MHP may be collinear. Furthermore, our findings regarding a lack of urban neighbourhood effects on the mental health of older residents in Central European and Western European countries also need to be confirmed.

Conclusion

Our study showed that in both countries, neighbourhood SE indicators were not associated with the mental health of the elderly. The overall prevalence of MHP was higher in Slovakia. In both countries, the risk of MHP of elderly arise more from their individual-level SE position than from the area they live in. Policies targeted at poverty prevention and economic deprivation can help in prevention of MHP.

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Key points

- International comparisons of factors associated with the mental health of the elderly in socioeconomically deprived neighbourhoods are fully lacking.
- Overall rates of mental health problems were higher among the elderly in Slovakia than in the Netherlands.
- The risk of mental health problems among the elderly is associated with their individual-level socioeconomic position rather than with the socioeconomic position of their living area.

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